Superfund Program
Proposed Plan

U.S. Environmental Protection
Agency, Region 2

111373

NL Industries, Inc. Superfund Site
July 2011

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the U.S. Environmental Protection Agency's (EPA's) proposed change to the groundwater remedy selected in the July 8, 1994 Record of Decision (ROD) for the NL Industries Inc., Superfund Site (Site), in Pedricktown, Salem County, New Jersey. This document is issued by EPA, the lead agency for Site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency. EPA, in consultation with NJDEP, will select the final remedy for the Site, documented in a Record of Decision Amendment, after reviewing and considering all information submitted during a 30-day public comment period. EPA, in consultation with NJDEP, may modify the preferred alternative or select another action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this document.

EPA is addressing the cleanup of the entire Site in two phases, called Operable Units. This Proposed Plan is for the groundwater component of Operable Unit 1 (OU1). OU1 addresses surface water, soils, stream sediments, and groundwater. The cleanup activities for the surface water, soils and stream sediments were completed in 2003. Operable Unit 2 (OU2) was completed in 1995 and addressed slag and lead oxide piles, contaminated surfaces and debris, and contaminated standing water. The OU1 surface water, soils and stream sediments along with OU2, are not the subject of this Proposed Plan.

As part of the OU1 ROD, EPA selected an extraction and treatment system to treat groundwater on-site from the unconfined aquifer and to discharge the treated groundwater to the Delaware River. The primary contaminants of concern in the groundwater are lead and cadmium. The treatment process for the pump and treat system was to include precipitation, clarification, and filtration. To date, the groundwater portion of the remedy has not been implemented.

During the OU1 cleanup activities for surface water, soils and stream sediments, groundwater continued to be monitored to ensure it was not impacting the drinking water of private residences and to evaluate the status of the contaminant plume. After the removal of the contaminated source material, it was noted that groundwater quality continued to improve over time. Accordingly, cleanup techniques, other than the pump and treat technology were evaluated for use at the Site.

This Proposed Plan describes the groundwater portion of the remedy that was initially selected in the 1994 OU1 ROD and explains why other remedial technologies are now being considered to address Site groundwater contamination. EPA's preferred groundwater remedy involves the injection of a reagent into the groundwater that will expedite and facilitate the precipitation of metal compounds (including lead and cadmium) and remove the contaminants from groundwater through adsorption to aquifer materials.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
June 22, 2011 – July 21, 2011
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: July 7, 2011
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held in the cafeteria of the Oldmans Township School, 10 Freed Road, Pedricktown, New Jersey at 6:30 pm.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region 2
290 Broadway, 18th Floor.
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday - 9 am to 5 p.m., by appointment.

Penns Grove Public Library,
222 South Broad Street,
Penns Grove, New Jersey 08069
(856) 299-4255
http://www.pgcplibrary.org/

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or Superfund). This Proposed Plan summarizes information that can be found in greater detail in the OU1 Focused Feasibility Study for Groundwater Remediation (FFS) report as well as in other documents contained in the Administrative Record for this Site (see box on previous page).

SITE DESCRIPTION

The Site is located to the north of the Pennsgrove-Pedricktown Road, in Pedricktown, Oldmans Township, Salem County, New Jersey. It is bisected by an active railroad. Approximately 16 acres are located north of the railroad tracks, including a closed 5.6-acre landfill that is not part of the Superfund Site. The southern 28 acres contain the former industrial area and the landfill access road. NL Industries maintains the landfill area and operates the landfill's leachate collection system with NJDEP oversight. The West and East Streams, parts of which are intermittent tributaries of the Delaware River, border and receive surface runoff from the Site. Wetland areas are located along the West Stream. Industrial properties are located east of the former NL Industries process area. U.S. Route 130 is located north of the Site. Several residential properties are located along Route 130 and adjacent to and west of the West Stream. Other properties in the general vicinity of the Site are used for commercial, residential, agricultural, and military purposes (See Figure 1).

SITE HISTORY

Between 1972 and 1984, NL Industries, Inc. and subsequently National Smelting of New Jersey (NSNJ), conducted secondary lead smelting and lead-acid battery reclamation operations. As a result of these operations, soil at the Site was contaminated with metals, primarily lead. In addition, elevated levels of lead, copper and zinc were detected in stream sediment and surface water. Groundwater contamination detected at the Site consisted primarily of lead and cadmium, with localized areas of elevated levels of volatile organic compounds (VOCs).

The Site was listed on the National Priorities List (NPL) in 1983 and a remedial investigation (RI) and feasibility study (FS) were conducted between 1986 and 1993. Between 1989 and 1996, EPA conducted multi-phased cleanup activities at the Site to address immediate public health concerns. Activities included, but were not limited to, the construction of security fences, encapsulation of slag (byproduct of smelting operations) piles, removal of toxic materials, demolition of buildings, and removal of the most highly contaminated stream sediments.

EPA divided the Site into two Operable Units to facilitate remedial activities. A ROD for OU2 was issued by EPA in 1991 and addressed slag and lead oxide piles, contaminated surfaces and debris, and contaminated standing water. OU2 activities were initiated in 1992 and included off-site reclamation of lead-containing materials, solidification/stabilization and off-site disposal of slag and other materials, decontamination of building floors and surfaces, off-site treatment and disposal of contaminated standing water, building demolition, and environmental monitoring. The OU2 activities were completed in September 1995.

The ROD for OU1 was signed in 1994 and addressed the remediation of soil, groundwater, surface water, and stream sediment. OU1 activities for the soil and stream sediment were initiated in January 2000. Remedial Action Objectives (RAOs) for OU1 included the following: 1) to leave no greater than 500 parts per million (ppm) of lead remaining in site soils and stream sediments; and 2) to restore the contaminated unconfined aquifer to drinking water standards for all contaminants. Established cleanup standards for each contaminant of concern (COC) for groundwater were listed in the ROD. To date, the groundwater portion of the remedy has not been implemented while the surface water and soils source removals were performed. Note that an Explanation of Significant Differences (ESD) was issued in 1999 and pertained to the soil/sediment portion of the remedy selected in the 1994 ROD. The ESD documented the change from disposing of excavated soil/sediment in an on-site landfill to the disposal of excavated soil/sediment to an off-site landfill.

<u>OU1 Soil/Sediment Activities</u>
Remedial activities included the excavation of soil and sediment containing greater than 500 ppm of lead, as stated in the OU1 RAOs. The soil and sediment remedial activities for OU1 were completed in July 2003 and a biological monitoring plan was initiated. Recent sampling showed that there are lead levels in the sediment above the cleanup standards in a portion of the West Stream between Pennsgrove–Pedricktown Road and Route 130. This contaminated sediment will require additional remediation, which is scheduled for the summer of 2011. The soil/sediment activities are not the subject of this Proposed Plan and will therefore not be discussed in further detail.

<u>OU1 Groundwater Activities</u>
OU1 groundwater monitoring was initially conducted during the RI in 1988 and 1989. Site-related contaminants were detected in the groundwater of the unconfined

aquifer at the Site during the RI and the data indicated that the contamination in groundwater was limited to the unconfined aquifer. The contaminants detected in the unconfined aquifer were comprised primarily of lead and cadmium; however, VOCs, arsenic and radiological parameters were also detected in localized areas of the Site. Arsenic was later determined to be related to landfill leachate. Subsequent improvements were made to the landfill, eliminating the seeps and the arsenic detections.

As part of the remedial design (RD), two phases of groundwater evaluations were conducted. Phase I was conducted in 1997. Twenty groundwater samples were collected and analyzed for VOCs, semi-volatile organic compounds (SVOCs), total and dissolved metals, cyanide and radiological parameters. Water quality parameters, such as pH and oxidation-reduction potential, were also monitored. Phase I sampling identified the relationship between pH and metal solubility in groundwater. Low groundwater pH was correlated with higher concentrations of lead and cadmium. The Phase I sampling also indicated that concentrations of COCs in groundwater at the Site had decreased since the late 1980's when the RI was conducted.

The Phase II groundwater evaluation was initiated in 1998 and included installation of additional monitoring wells, sampling of potable groundwater from residential wells along Route 130, aquifer testing, evaluation of the capture zone of groundwater extraction wells, geochemical evaluation of Site subsurface soils, and groundwater flow and transport modeling. As a result of Phase II analysis, radiological parameters were determined to be naturally occurring and not related to the Site and therefore required no further analysis. Aquifer testing revealed that there were adequate amounts of iron and manganese oxide/hydroxide coatings in the aquifer soils to provide adsorption capacity for lead and cadmium that is anticipated to precipitate out of groundwater or otherwise adsorb onto soil at the Site. Pump tests indicated that constant pumping of the contaminated groundwater was not highly efficient at removing lead and cadmium. It was calculated that it would take between 50 and 60 years of aggressive pumping to remove lead and cadmium from the groundwater and achieve cleanup standards. Furthermore, Phase II testing continued to show a decrease in the mass of lead and cadmium remaining in the groundwater.

The decreased contaminant concentrations observed in the Phase I and Phase II groundwater evaluations, as well the availability of newer remedial technologies, prompted the investigation into other potential groundwater remedies that may be more efficient than the pump and treat alternative selected in the 1994 OU1 ROD.

PRINCIPAL THREATS

The term "principal threat" waste usually applies to materials that are acting as a source of contamination. This Proposed Plan addresses groundwater contamination. Contaminated groundwater generally is not considered to be a source material and is therefore not categorized as a "principal threat."

WHAT IS A "PRINCIPAL THREAT"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in ground water may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

SITE CHARACTERISTICS

Groundwater contamination is limited to the unconfined aquifer which is part of the Cape May Formation and averages approximately 20 feet in thickness. The unconfined aquifer has historically been subdivided into two zones, the shallow and deep zones, which are screened between approximately 5 feet and 50 feet below grade. The terms shallow and deep relate to screened intervals of monitoring wells and not to geologic materials.

Groundwater flow direction in the unconfined aquifer, as inferred based on groundwater elevation data, is primarily west across the Site towards the West Stream. The groundwater flow rate is approximately 27.5 feet per year; however, contaminants do not flow at this rate since other reactions, such as adsorption, limit the mobility of lead and cadmium, which are the primary COCs.

In addition to groundwater sampling in the 1980's and 1990's, groundwater monitoring was conducted in 2004, 2007 and 2010. Data from all groundwater monitoring events indicate that the lead and cadmium concentrations have generally decreased over time and that the majority of the contaminated groundwater is located beneath the former facility area. Significant migration of contaminants has not been observed in recent sampling events. Between 1983 and 2010, the mass of lead in the groundwater decreased from approximately 220 pounds to 2.7 pounds. For cadmium, the mass has decreased from approximately 70 pounds in 1988 to 5.9 pounds in 2010. The current volume of groundwater impacted by lead is approximately 1.5 million gallons and 11.8 million gallons for cadmium.

Residential groundwater sampling was also conducted in 2004, 2006, 2007 and 2010 for those residences located north of the Site along Route 130. During each of these monitoring events, lead and cadmium concentrations in the residential water samples were either not detected, were significantly below the applicable New Jersey drinking water standards, or had minor detections believed to be a result of plumbing issues as opposed to site-related contaminant detections.

Removal of contaminated source material, as a result of OU1 soil/sediment and OU2 activities, has resulted in the observed significant decrease in lead and cadmium groundwater concentrations. It has also allowed for pH values to begin equilibrating. The increasing pH values can also account for the continued decrease in lead and cadmium concentrations in groundwater. At low pH, metals are more soluble and tend to stay in solution. At higher pH values, the metals tend to adsorb to the aquifer soils. Oxidation-Reduction potential (Eh) also contributes to metal solubility.

While lead and cadmium have significantly decreased over time, the concentrations still exceed the current drinking water standards.

VOCs have historically been detected at the Site in localized areas. Total VOC concentrations have generally decreased over time via natural attenuation processes and these concentrations are expected to continue to decrease. Groundwater data collected in 2010 indicate that vinyl chloride and tetrachloroethene are the only site-related VOCs detected above the drinking water standards. Further, these two contaminants have been detected at only three of the twenty-eight groundwater monitoring wells at concentrations slightly exceeding the drinking water standards. All COCs initially listed in the ROD, including vinyl chloride, will continue to be monitored to ensure that cleanup levels are achieved.

SCOPE AND ROLE OF THIS ACTION

This is a proposed amendment to the July 8, 1994 ROD for the NL Industries, Inc. Superfund Site. The 1994 ROD selected extraction and treatment of groundwater to address the threats posed by contaminated groundwater in the unconfined aquifer. However, groundwater monitoring data, including the most recent December 2010 data, indicate that the concentrations of COCs have significantly decreased over time and new technologies for remediation of contaminated groundwater have been developed, leading EPA to investigate alternative groundwater remedies that may be more efficient than extraction and treatment to address the remaining contaminated groundwater.

A summary of the investigated alternative remedies is presented below along with an assessment of EPA's preferred alternative.

SUMMARY OF OPERABLE UNIT 1 RISKS

The purpose of the risk assessment is to identify potential cancer risks and non-cancer health hazards at the Site assuming that no further remedial action is taken. A baseline risk assessment was conducted as part of the RI (O'Brien and Gere, 1990) and was based on COC concentrations from groundwater samples collected in 1989. The baseline risk assessment addressed the potential risks to human health by identifying potential exposure pathways by which the public may be exposed to contaminated groundwater (via ingestion). Groundwater exposures were assessed for both potential present and future land-use scenarios. Current land use was considered to be an industrial facility and future land use was characterized as either an industrial facility or residential area in the risk assessment. Current receptors included off-site residents (child and adult) and off-site workers. Future receptors included on-site residents (child and adult), off-site residents (child and adult), on-site workers and off-site workers. Results of the quantitative risk assessment concluded that there was an unacceptable risk for the potential future receptors due to exposure to contaminated groundwater via ingestion, with the exception of the on-site worker. The potential exposure pathways, land-use scenarios and receptors identified in the 1990 risk assessment remain applicable for the Site; therefore, the original risk assessment is still valid. An ecological risk assessment was also conducted in 1992. It was determined that the two media potentially posing a risk to ecological receptors were the stream sediment and wetland soils. Groundwater was not found to be posing a significant ecological risk.

The unconfined aquifer at the site is classified as a Class II aquifer in the state of New Jersey. The designated use of Class II groundwaters is to provide potable water and this is considered to be the most beneficial use for the aquifer. Accordingly, while the groundwater at the site is not currently being used for drinking water, the goal is to restore the aquifer to its most beneficial use.

A review of the most recent groundwater data reveals that the concentrations of COCs, primarily cadmium and lead, continue to exceed their respective NJDEP Groundwater Quality Criteria and Federal Maximum Contaminant Levels. These standards were promulgated to ensure that public water systems used as potable water sources remain protective of human health by limiting levels of contaminants in the drinking water. The RAO for the Site is to restore the site-related contaminated portions of the unconfined aquifer to drinking water standards for all contaminants; this RAO has not yet been met for all of the constituents. Therefore, unacceptable human health risk to a potentially exposed population from direct exposure to groundwater remains. It is EPA's current judgment that a remedy is required to restore groundwater and achieve the RAOs, and is necessary in order to protect human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

The following RAOs have been identified for groundwater at the Site:

- Restore the contaminated unconfined aquifer to drinking water standards for all contaminants;
- Minimize the potential for migration of contaminants of concern in groundwater; and
- Prevent or minimize potential future human exposures, including ingestion of groundwater, which presents an unacceptable risk to public health and the environment.

The cleanup of groundwater at this Site is primarily based on the remediation of lead and cadmium, which are the primary contaminants of concern, to concentrations that meet established drinking water standards. The risk should be eliminated by meeting the most stringent of the Federal Maximum Contaminant Levels (MCLs), the New Jersey MCLs and the New Jersey Groundwater Quality Standards (NJGWQS) for all contaminants of concern. For lead and cadmium, the most stringent standards are the NJGWQS which are 5 parts per billion (ppb) and 4 ppb, respectively.

SUMMARY OF REMEDIAL ALTERNATIVES

Potential applicable technologies were identified and screened using effectiveness, implementability and cost as the criteria, with emphasis on the effectiveness of the remedial action. Those technologies that passed the initial screening were then assembled into four remedial alternatives.

The time frames below for construction do not include the time for designing the remedy, nor do they include the time to procure necessary contracts.

Alternative 1 - No Action

The No Action alternative was retained for comparison purposes as required by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). Under the No Action Alternative, no remedial actions would be taken to address groundwater contamination. Institutional and engineering controls would not be implemented to restrict the use or access to contaminated groundwater. Furthermore, there would be no monitoring associated with this alternative to evaluate progress toward achieving the RAOs.

Total Capital Cost	$0
Operation and Maintenance	$0
Total Present Net Worth	$0
Timeframe	0 years

Alternative 2 – Monitored Natural Attenuation Plus Institutional Controls

In this alternative, Monitored Natural Attenuation (MNA) involves the reliance on natural attenuation processes to achieve the Site-specific remediation objectives. Natural attenuation processes include biochemical reactions, dispersion, dilution and sorption processes that occur naturally in the subsurface and serve to reduce contaminant levels from groundwater at the Site. Adsorption appears to be the primary mechanism of MNA attributing to decreased contaminant concentrations at the Site. The MNA alternative would also include a monitoring plan to track contaminant concentrations and determine when the cleanup standards have been achieved. Furthermore, this alternative would include the implementation of institutional controls, such as a Classification Exception Area (CEA), to limit access and potential use of impacted groundwater at the Site. This would protect human health and the environment until cleanup standards are achieved.

Total Capital Cost	$163,399
Operation and Maintenance	$1,049,805
Total Present Net Worth	$1,213,204
Timeframe	>50 years

Alternative 3 – Reagent Injection Plus Institutional Controls

Reagent injection involves the introduction of a reagent into the water table aquifer using injection wells or well points. The reagent injection technique is based on the

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fact that metals dissolved or entrained in groundwater may react to form insoluble compounds and precipitate, or otherwise be immobilized by adsorption onto a substrate and/or by incorporating the metal into a molecular structure (intercalation) which may then adsorb or become incorporated into the soil as a complex or precipitate. Based on preliminary bench-scale treatability studies, it appears that phosphate reagents would be highly effective at binding both lead and cadmium in less soluble metal complexes in the groundwater. A more alkaline environment (pH of approximately 8.0 – 9.0) would be created through addition of a basic compound to promote reactions between the native metals and the soil. This increased pH value is not required to be maintained following reagent injection and would return to ambient levels (pH 5.0 – 6.0) over time. The reagent (likely phosphate) would then be introduced to promote intercalation reactions to more permanently remove lead and cadmium from the groundwater. This remedial alternative would also include continued monitoring of all COCs initially listed in the 1994 ROD, including site-related VOCs. The low concentrations of VOCs observed in recent groundwater monitoring data are expected to continue to decrease to acceptable levels via natural attenuation processes.

Effectiveness of this remedial alternative would be assessed by periodic groundwater sampling and analysis to ensure that cleanup goals are achieved for all COCs. This alternative would also include implementation of institutional controls, such as a CEA, to limit access and potential use of impacted groundwater at the Site. This would protect human health and the environment until cleanup standards are achieved.

Total Capital Cost	$890,489
Operation and Maintenance	$684,766
Total Present Net Worth	$1,575,255
Timeframe	<10 years

Alternative 4 – Pump and Treat Plus Institutional Controls

In this alternative, a well point system would be used to pump contaminated groundwater into a treatment plant which would be constructed on-site. This was the remedy selected in the 1994 ROD and is presented here again for the purpose of comparing this remedy to the other alternatives. The treatment steps initially described in the 1994 ROD included a 250 gallon per minute pump rate and precipitation/flocculation followed by an ion-exchange polishing step. Following treatment, the water would be pumped to the Delaware River and discharged. An effluent outfall would be constructed at the discharge location. The distance from the Site to the Delaware River is approximately 1.5 miles.

Effectiveness of the pump and treat alternative would be assessed by periodic groundwater sampling and analysis. This alternative would also include implementation of institutional controls, such as a CEA, to limit access and potential use of impacted groundwater at the Site. This would protect human health and the environment until cleanup standards are achieved.

Total Capital Cost	$1,560,298
Operation and Maintenance	$4,128,108
Total Present Net Worth	$5,688,406
Timeframe	>50 Years

EVALUATION OF ALTERNATIVES

EPA uses nine evaluation criteria to assess remedial alternatives individually and against each other in order to select a remedy. The criteria are described in the box on the next page. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. A detailed analysis of each of the alternatives is presented in the Focused Feasibility Study for Groundwater Remediation report which can be found in the Administrative Record.

Overall Protection of Human Health and the Environment

Alternative 1 - No Action will not be protective of human health and the environment because this alternative does not include implementation of institutional controls to restrict the use of contaminated groundwater and does not include monitoring to determine when the applicable standards have been met and the RAOs have been achieved. Alternative 2 – MNA Plus Institutional Controls, Alternative 3 – Reagent Injection Plus Institutional Controls and Alternative 4 – Pump and Treat Plus Institutional Controls are all protective of human health and the environment as they all include institutional controls to restrict the use of groundwater until cleanup goals are met, will result in the decrease of site-related contaminants and include a monitoring plan to determine when the RAOs have been achieved. However, Alternatives 2, 3 and 4 are estimated to achieve the cleanup standards in varying lengths of time.

Compliance with Applicable or relevant and Appropriate Requirements (ARARs)

Alternative 1, No Action, would not comply with ARARs since a determination as to whether or not the applicable standards have been met would not be able to be made due to the lack of monitoring. Alternatives 2, 3 and 4 are

THE NINE SUPERFUND EVALUATION CRITERIA

1. Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

3. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.

6. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

7. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

8. State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

***9.* Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

expected to comply with the applicable ARARs including the NJGWQS. Alternative 4 would also comply with New Jersey Pollution Discharge Elimination System (NJPDES) regulations for off-site discharge of treated groundwater to the Delaware River as well as Resource Conservation and Recovery Act (RCRA) regulations for wastes generated from the pump and treat operations.

Long-Term Effectiveness and Permanence

The highest degree of permanence and long-term effectiveness is achieved for those alternatives that result in the greatest removal of contaminants from the Site. Alternative 1, No Action, does not provide a mechanism to monitor contaminant migration or attenuation; therefore long-term effectiveness and permanence cannot be determined. Alternative 2 – MNA Plus Institutional Controls, Alternative 3-Reagent Injection Plus Institutional Controls and Alternative 4-Pump and Treat Plus Institutional Controls are all expected to mitigate long-term risks from site contaminants; however, Alternative 3 – Reagent Injection Plus Institutional Controls has a higher degree of permanence due to the chemical reaction with the reagent in which the primary contaminants of concern, lead and cadmium, are bound in less soluble metal complexes in the groundwater.

The Alternative 3 reagent injection technology permanently removes cadmium and lead from solution by precipitating them as metal phosphates. The metals are incorporated into a crystalline lattice using the phosphate precipitation process. Metal phosphates are highly insoluble and, it has been suggested, that their low solubility renders metals in metal phosphates non-bioavailable. Over the long-term, it is anticipated that the pH levels in groundwater at the Site will equilibrate to ambient levels, typically between pH 5 and 6. The ambient pH will not cause any significant resolubilization of lead or cadmium after the metals have reacted to form metal phosphate compounds and/or these phosphate compounds have adsorbed to the aquifer materials. Resolubilization is a potential concern with Alternative 2, MNA. If there were to be a scenario where there was a significant shift in pH toward acidic conditions, the pH shift could potentially cause desorption of lead and cadmium from aquifer surfaces. Alternative 4 – Pump and Treat, requires a significantly longer period of time to meet the applicable standards and is therefore not as efficient in removing contaminants as Alternative 3 – Reagent Injection.

Reduction of Toxicity, Mobility, or Volume through Treatment

Groundwater concentrations of site-related contaminants have generally decreased over time, as evidenced through the groundwater monitoring events. Furthermore, there has been minimal migration of the groundwater plume. Alternative 1 – No Action and Alternative 2 – MNA Plus Institutional Controls do not involve active treatment processes and are therefore not discussed for comparison in this criterion. However, note that the No Action and MNA alternatives would not be expected to achieve cleanup goals in a reasonable timeframe. Alternative 3 – Reagent Injection Plus Institutional Controls and Alternative 4 – Pump and Treat Plus Institutional Controls are expected to reduce the toxicity, mobility or volume of contaminants to meet the applicable standards; however,

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the Alternatives are estimated to achieve these reductions at different rates.
Alternative 4 – Pump and Treat Plus Institutional Controls is expected to take over 50 years to reduce the contaminant levels to concentrations meeting the applicable standards. Alternative 3 – Reagent Injection Plus Institutional Controls is expected to reduce contaminant levels to concentrations meeting the applicable standards in less than 10 years through active treatment. This increased rate of reduction is due to the mechanisms in which the primary contaminants of concern, lead and cadmium, will be removed from solution. Reagent injection utilizes both natural processes, including biochemical reactions, dispersion, dilution and sorption in addition to active treatment to enhance the formation of metal phosphates which eliminates the bioavailability of lead and cadmium in the aquifer.

Short-Term Effectiveness

With the exception of Alternative 1 – No Action, which has no impact on short-term effectiveness, all of the Alternatives (2, 3 and 4) are expected to have minimal impacts on remediation workers and nearby residents during remedy implementation. Alternative 2 – MNA and Alternative 3 – Reagent Injection mainly involve the installation of monitoring wells/injection points while Alternative 4 – Pump and Treat involves the construction of a groundwater treatment plant which is anticipated to take longer to construct and include more construction and physical disturbance at the Site.

The potential risks to Site workers and area residents during remedy implementation will be addressed by adherence to protective worker practices, safety standards, and equipment. A site-specific health and safety plan will be prepared and trained personnel will perform remedial activities. Appropriate personnel monitoring and emission controls and monitoring will be provided, as needed, during remedy implementation.

Implementability

All of the alternatives are technically and administratively feasible, have been implemented at other similar sites, and make use of standard engineering practices. Alternative 1 - No Action requires the least effort to implement; however, without having the monitoring component to determine effectiveness of the remedy, it would not demonstrate when RAOs have been met.

Alternative 2 – MNA Plus Institutional Controls would be the most readily implementable alternative as it only involves installation of monitoring wells and subsequent monitoring. Alternative 3 – Reagent Injection would require a pilot study to optimize its effectiveness as well as the installation of monitoring/injection wells. Alternative 4 – Pump and Treat Plus Institutional Controls would be the most difficult to implement as it would require the greatest degree of construction and acquisition of permits, such as the NJPDES permit for off-site discharge of the treated groundwater. The availability of service and materials required for the implementation of all alternatives is adequate. All alternatives, other than Alternative 1, require services and materials that are currently readily available from technology vendors, and are therefore, not expected to present a challenge to remedy implementation.

Cost

Alternative 1 - No Action has the lowest capital cost, but because of the lack of monitoring, achievement of remedial success could not be measured. Aside from Alternative 1 – No Action, Alternative 2 - MNA Plus Institutional Controls has the lowest capital cost of $163, 399 and would be the least costly alternative to implement with a total present net worth of approximately $1.2 million which includes a 30-year groundwater monitoring program and well installation. Alternative 3 – Reagent Injection Plus Institutional Controls is estimated to have a capital cost of $890,489 and an overall present net worth cost of approximately 1.6 million assuming a 10-year groundwater monitoring program. This is comparable to the cost of Alternative 2. Alternative 4 – Pump and Treat Plus Institutional Controls is the most expensive alternative with an estimated capital cost of $1.6 million and a present net worth cost of approximately $5.7 million which includes a 30-year groundwater monitoring program.

State/Support Agency Acceptance

The State of New Jersey concurs with the Preferred Alternative.

Community Acceptance

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for this site. The Record of Decision is the document that formalizes the selection of the remedy for a site.

SUMMARY OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for cleanup of the groundwater at the NL Industries, Inc. Superfund Site is Alternative 3 – Reagent Injection Plus Institutional Controls.

Reagent Injection is an *in-situ* treatment whereby a reagent is injected into the groundwater aquifer via injection wells or well points. The reagent applied will be selected based upon the results of the bench-scale treatability study (BSTS), as presented in the Focused Feasibility Study for Groundwater Remediation (FFS), and a field pilot study, which will be conducted as part of the Remedial Design. Preliminarily, the results of the BSTS reveal that phosphate reagents will be highly effective for treating lead and cadmium in groundwater. The use of phosphates for treating impacted soils and waters has been widely used to immobilize inorganic constituents, including lead. The field pilot study will confirm effectiveness at the Site and assist in calculating parameters required for successful remediation (i.e., number of well points, spacing, application method, etc.).

The reagent injection technique is based on the fact that metals dissolved or entrained in groundwater may react to form insoluble compounds and precipitates, or otherwise be immobilized by adsorption onto a substrate (i.e., the native soil) and/or by incorporating the metal into a molecular structure (intercalation) which may then adsorb or become incorporated into soil as a complex or precipitate. Reactions with phosphates tend to result in intercalation under proper conditions.

In order to promote the desired reactions, a more alkaline environment (pH of approximately 8.0 – 9.0) will be created prior to the reagent injection through addition of a basic compound into the groundwater aquifer to foster reactions between the native metals and the soil. The increased pH value is not required to be maintained following reagent injection and will return to ambient levels (i.e., pH of approximately 5.0 – 6.0) over time. The reagent will then be injected into the groundwater aquifer via a number of injection points. Generally speaking, precipitation reactions, such as those induced through certain injection reagents, including phosphates, follow a kinetic order of reaction. The order of reaction varies from compound to compound and with the geochemical conditions in which the reagent is applied (e.g., pH and reagent concentration); however, with the current Site conditions and concentrations of lead and cadmium in groundwater, it is anticipated that lead and cadmium will react with the phosphates first, followed by the non-target compounds (i.e., calcium and aluminum). This remedial alternative will also include continued monitoring of all COCs initially listed in the 1994 ROD, including site-related VOCs. The low concentrations of VOCs detected in recent groundwater monitoring data are expected to continue to decrease to acceptable levels via natural attenuation processes.

The effectiveness of the preferred alternative will be assessed by periodic groundwater sampling and analysis. Quarterly sampling is proposed initially; however, the monitoring frequency will be modified based upon the data obtained during the pilot study and initial post-reagent injection monitoring events.

Institutional controls will also be implemented to prevent exposure to contaminated groundwater until the cleanup standards have been achieved for all COCs.

This alternative is estimated to take less than 10 years to achieve the cleanup standards. Therefore, as per EPA policy, 5-Year Reviews will be performed until remedial goals are achieved.

The preferred remedy was selected over other remedies because it is expected to achieve substantial and long-term risk reduction through treatment in the most efficient and timely manner.

Based on information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative will satisfy the statutory requirements of CERCLA Section 121(b); however, Alternative 4 – Pump and Treat Plus Institutional Controls will be retained as a contingency remedy.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to implementation of the selected remedy.

COMMUNITY PARTICIPATION

EPA and NJDEP provided information regarding the cleanup of the NL Industries, Inc. Superfund Site to the public through meetings, the Administrative Record file for the site, mailings and announcements published in *Today's Sunbeam*. EPA and NJDEP encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

For further information on EPA's Preferred Alternative for the NL Industries, Inc. Superfund Site, please contact one of the following:

Theresa Hwilka	Natalie Loney
Remedial Project Manager	Community Relations
(212) 637-4409	(212) 637-3639

U.S. EPA
290 Broadway 19th Floor
New York, New York 10007-1866

The dates of the public comment period; the date, the location and the time of the public meeting; and the locations of the Administration Record files are provided on the front page of this Proposed Plan.

NL Industries, Inc. Superfund Site information and reports can also be found online at the following address:

http://www.epa.gov/region02/superfund/npl/nlindustries/pdf/PRAP.pdf

GLOSSARY

ARARs: Applicable or Relevant and Appropriate Requirements. These are Federal or State environmental rules and regulations that may pertain to the Site or a particular alternative.

Carcinogenic Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund hazardous waste sites is 1×10^{-4} to 1×10^{-6}, meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a Site contaminant that is not remediated.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act. A Federal law, commonly referred to as the "Superfund" Program, passed in 1980 that provides for response actions at sites found to be contaminated with hazardous substances, pollutants or contaminants that endanger public health and safety or the environment.

COPC: Chemicals of Potential Concern.

SLERA: Screening Level Ecological Risk Assessment. An evaluation of the potential risk posed to the environment if remedial activities are not performed at the Site.

FS: Feasibility Study. Analysis of the practicability of multiple remedial action options for the Site.

Groundwater: Subsurface water that occurs in soils and geologic formations that are fully saturated.

HHRA: Human Health Risk Assessment. An evaluation of the risk posed to human health should remedial activities not be implemented.

HI: Hazard Index. A number indicative of noncarcinogenic health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effects.

HQ: Hazard Quotient. HQs are used to evaluate noncarcinogenic health effects and ecological risks. A value equal to or less than one indicates that the human or ecological population are not likely to experience adverse effects.

ICs: Institutional Controls. Administrative methods to prevent human exposure to contaminants, such as by restricting the use of groundwater for drinking water purposes.

Nine Evaluation Criteria: See text box on Page 7.

Noncarcinogenic Risk: Noncancer Hazards (or risk) are expressed as a quotient that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. USEPA's threshold level for noncarcinogenic risk at Superfund sites is 1, meaning that if the exposure exceeds the threshold; there may be a concern for potential noncancer effects.

NPL: National Priorities List. A list developed by USEPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Operable Unit (OU): a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site.

Present-Worth Cost: Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well as the cost of long-term operations, maintenance, and monitoring.

Proposed Plan: A document that presents the preferred remedial alternative and requests public input regarding the proposed cleanup alternative.

Public Comment Period: The time allowed for the members of a potentially affected community to express views and concerns regarding USEPA's preferred remedial alternative.

RAOs: Remedial Action Objectives. Objectives of remedial actions that are developed based on contaminated media, contaminants of concern, potential receptors and exposure scenarios, human health and ecological risk assessment, and attainment of regulatory cleanup levels.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and public comments on the selected remedy.

Remedial Action: A cleanup to address hazardous substances at a site.

RI: Remedial Investigation. A study of a facility that supports the selection of a remedy where hazardous substances have been disposed or released. The RI identifies the nature and extent of contamination at the facility and analyzes risk associated with COPCs.

TBCs: **"**To-be-considereds," consists of non-promulgated advisories and/or guidance that were developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

USEPA: United States Environmental Protection Agency. The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and final approval authority for the selected ROD.

VOC: Volatile Organic Compound. Type of chemical that readily vaporizes, often producing a distinguishable odor.

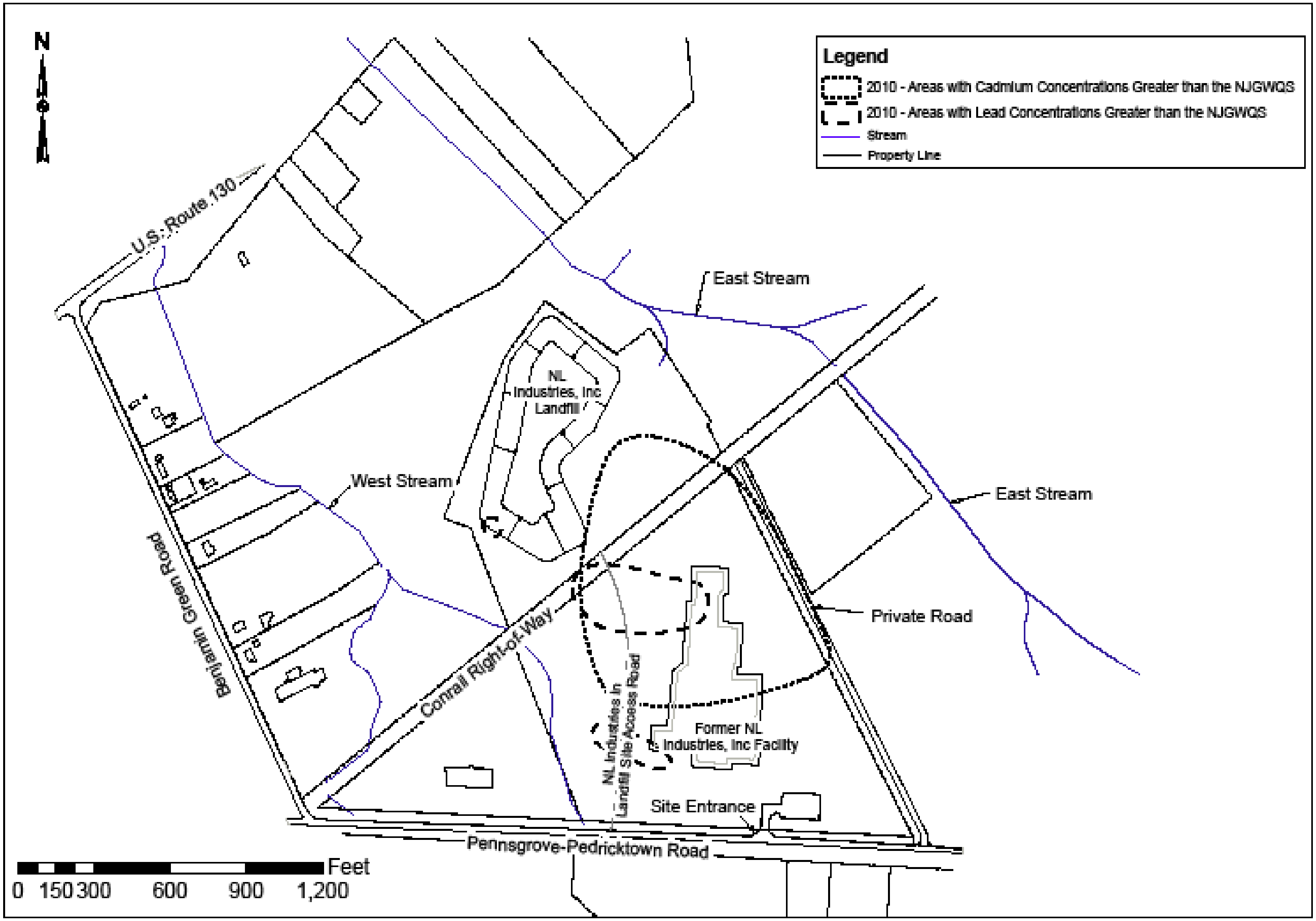

Figure 1 – NL Industries, Inc. Superfund Site Map

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